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E04B 1/40

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E1D
E1S
Selected US specifications from IPC sub-class E04B

(54) Builders straps with fasteners and anchors

(57) A two part strap assembly 10 has first and second strap parts 11 and 12 which are connected together by means of elongate slots 15 in the material of the strap. The strap ends 11 and 12 are overlapped (see Fig. 2) so that the borders 16 of the slots come into alignment and an apertured member 17 is driven through the slots. The apertured member 17 then receives an anchor member 22 driven into the aperture (18 Fig. 2), which traps the strap parts in abutment with the apertured member and clamps them rigidly together. The anchor member can be deformed to hold the assembly permanently together. In a preferred form, the anchor member has two tapered limbs (23 Fig. 5) which straddle the strap ends in the aperture (18 Fig. 3) and clamp them rigidly together by a wedging action, the limbs (23) being deformed in opposite directions after assembly.

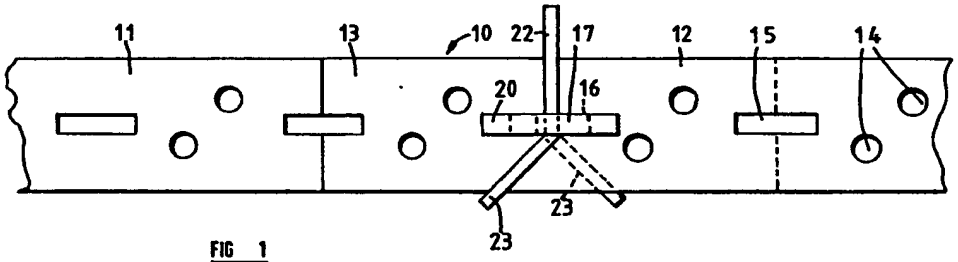

FIG 1

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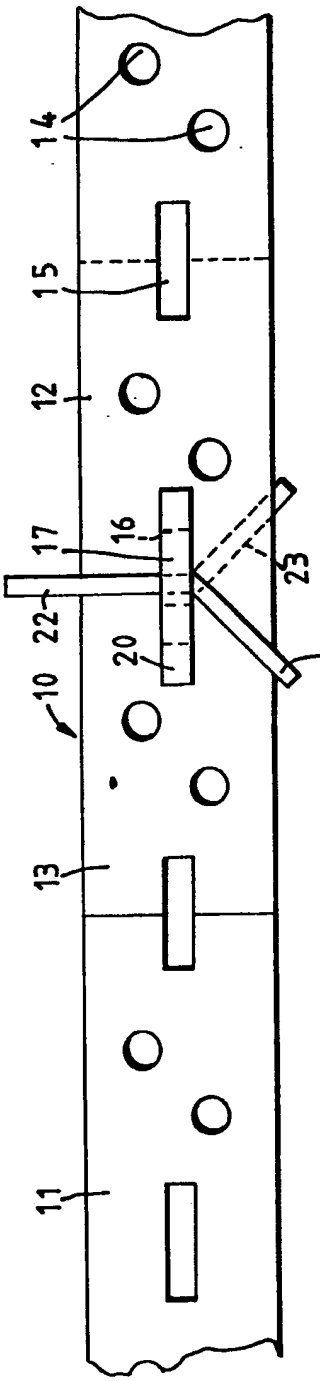

FIG 1

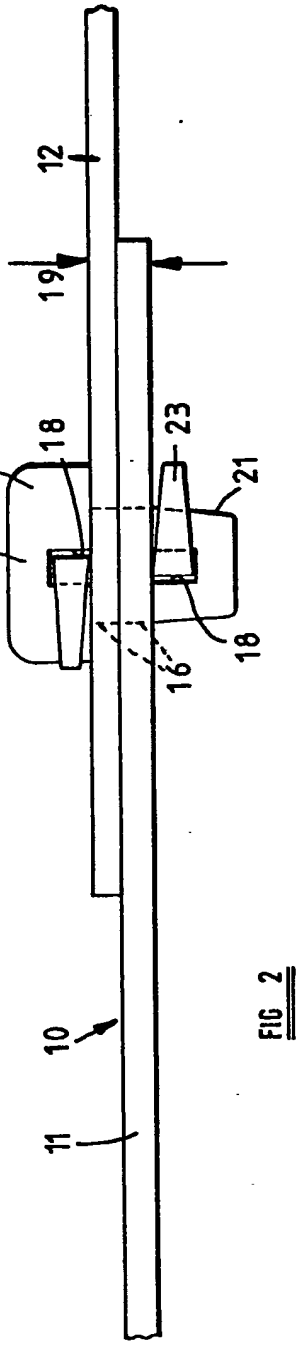

FIG 2

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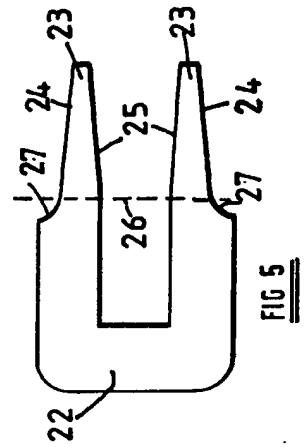

FIG 5

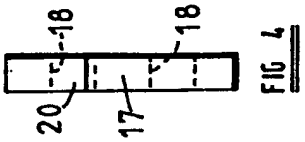

FIG 4

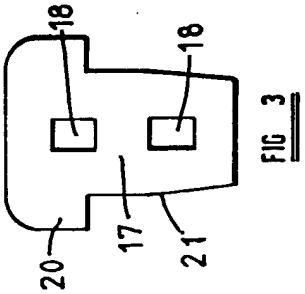

FIG 3

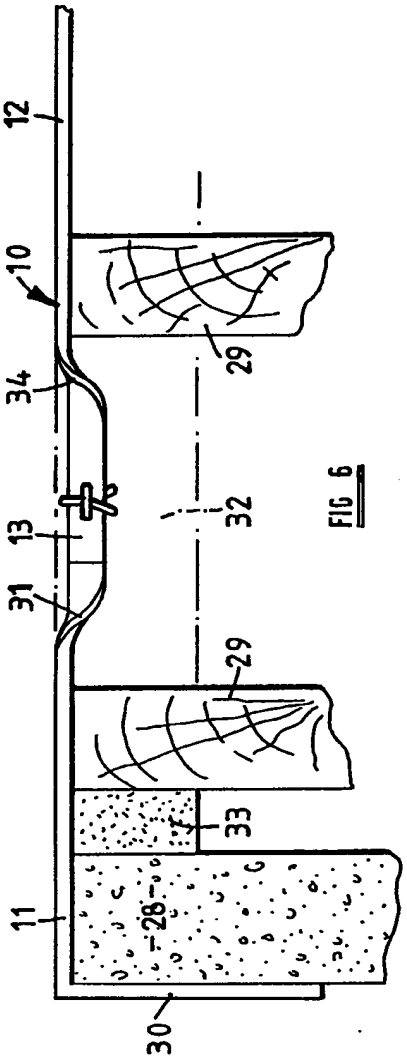

FIG 6

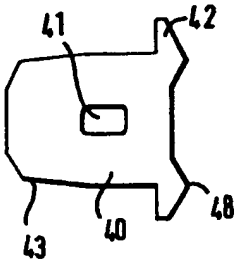

FIG 7

FIG 8

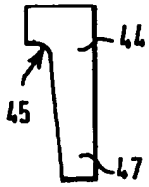

FIG 9

FIG 10

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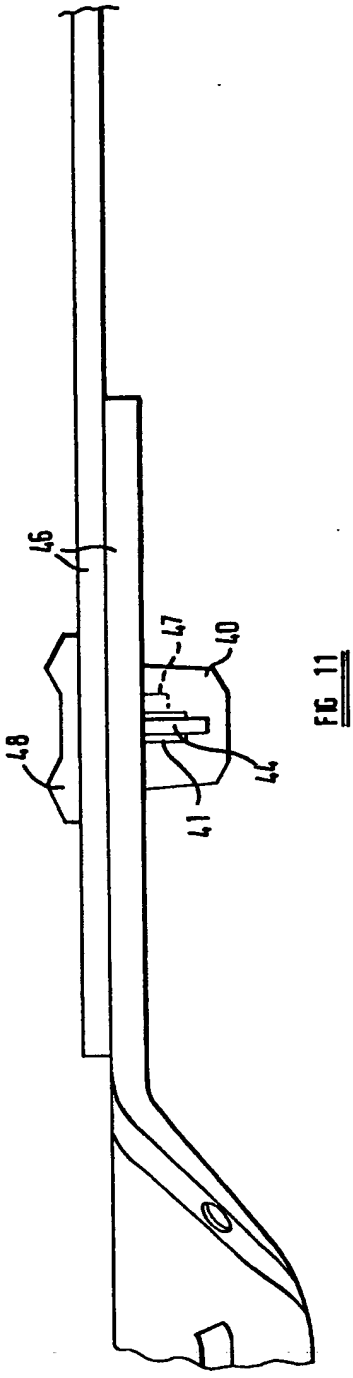

FIG 11

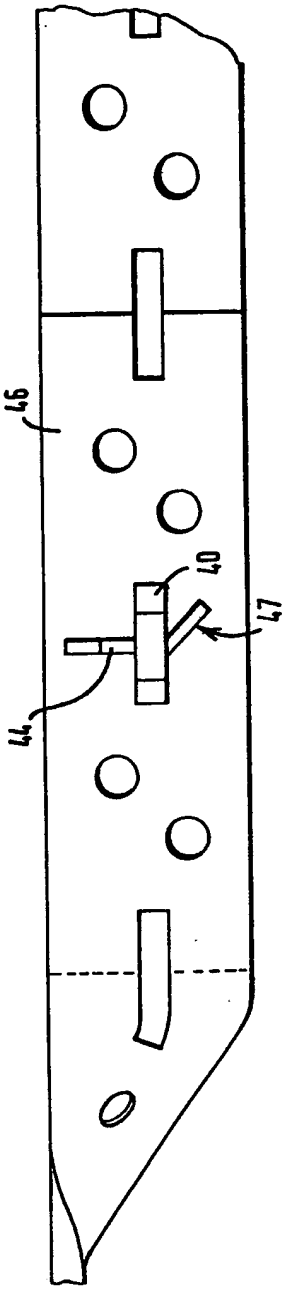

FIG 12

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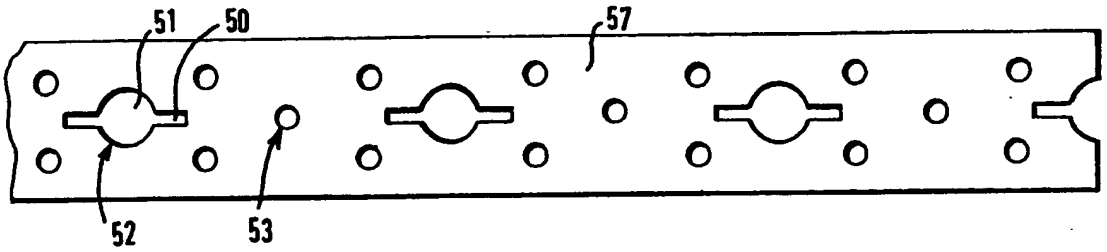

FIG 13

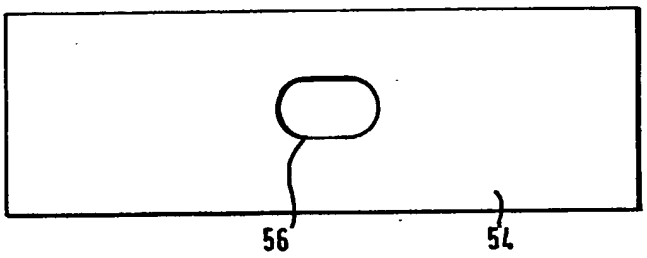

FIG 14

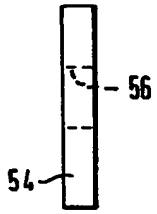

FIG 15

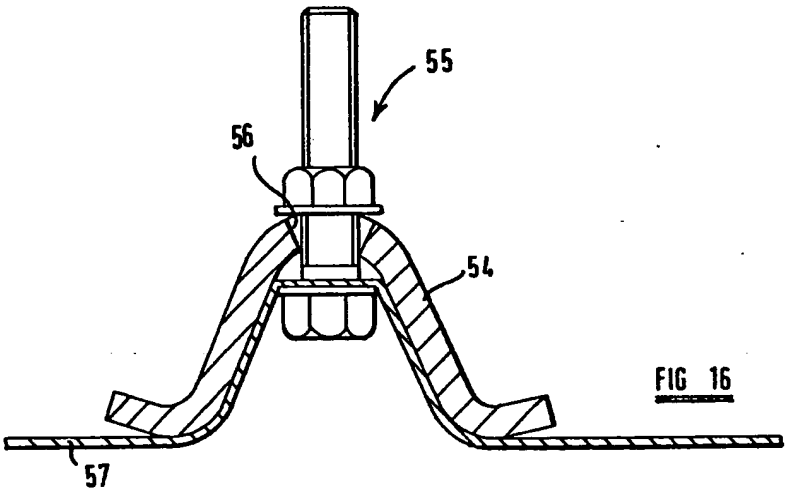

FIG 16

SPECIFICATION

Straps for use in building

This invention relates to straps for use in building.

Metal straps are used to provide lateral and vertical restraint in many parts of a building, for example by securing the "diaphragm" formed by floor joists and flooring to an adjacent wall; or securing down roof trusses to supporting walls. Straps serve to improve the structural integrity of a building and restrain the major structural components from relative movement under for example storm conditions, snow loading, subsidence or the like.

Straps are also used in refurbishment of old buildings to support weak masonry and to assist in connecting new parts of the building to the original structure.

Because straps are used in such a versatile manner in building, many different configurations of strap are required for different applications. For example, the end of a strap may be plain, or may be angled at 90°, or may be provided with a fish tail or similar formation for embedding in a mortar coursing joint of masonry. A strap may need one or more twists so as to be positioned along the side face of a joist perpendicular to a wall for example. The length of the strap may vary considerably, depending on the expected loading and the position and nature of its use. However, typically, roof or floor straps are of the order of 800 mm to 1 metre in length and may be between about 2.5 and 5 mm thick.

It can be expensive to manufacture and stock all the different desirable configurations, because of the size and the amount of metal required for a strap. There are also problems because, in use, a first end of the strap is usually secured in or to a masonry wall, leaving the other end projecting. This therefore provides a safety hazard for workmen and can obstruct the placing of joists and other parts of the building. If the long projecting length of the strap is moved, for example to enable a joist to be secured in position, there is a danger of the leverage exerted on the strap tending to loosen it from its position keyed into the mortar coursing joint of a wall.

It is therefore an object of the present invention to provide a strap for use in building which can overcome or reduce some or all of these disadvantages.

According to the invention, when viewed from a first aspect, there is provided a strap assembly for building, the assembly comprising a first strap part and a second strap part, each part having at least one longitudinal slot in an end portion to be connected to the other part; the assembly further comprising clamping means including an apertured member of a size adapted to be inserted as a sliding fit in the aligned slots when said end portions are overlapped, the apertured member having an aperture and a location means spaced from the aperture by no more than the thickness of the overlapped end portions; and anchor means adapted to be inserted through the aperture and permanently secured therein to prevent disengagement of the apertured member from the slots.

The location means may comprise a second aperture. Alternatively, it may comprise a projection, for example a head, of the apertured member. In either case, the overlapped end portions are positionally located by said anchor means between the aperture and the location means.

The apertured member may have a head of shallow dimensions relative to the thickness of the strap. The head may include taper means directed away from said aperture to permit it to be driven into timber.

The anchor means may be deformed after insertion, so as to secure the anchor means permanently in position.

The anchor means preferably include at least one wedge, adapted to force the first and second strap parts together when the anchor means is inserted into the apertured member.

The anchor means may be bifurcated to provide a pair of limbs adapted to be inserted respectively in two apertures of the apertured member. The limbs may each be of a wedge shape. Preferably, after insertion, the free ends of the limbs are deformed in opposite directions out of the general plane of the anchor means.

The anchor means and apertured member may be made of sheet or strip metal, for example galvanised mild steel or stainless steel.

One or both of the strap parts may be formed with a twist.

Viewed from a further aspect, the invention provides a method of building using a strap.

According to this aspect of the invention, there is provided a method of building including the steps of taking a first strap part and a second strap part, each part having at least one longitudinal slot in an end portion;

securing the first strap part to a building structure;

overlapping said end portions to align the said slots;

taking an apertured member having an aperture and a location means spaced from the aperture by no more than the thickness of the overlapped end portions;

inserting the apertured member through said aligned slots;

and inserting an anchor means through said aperture of the apertured member and permanently securing the anchor means therein.

The anchor means may be secured by deforming it after insertion in the apertured member.

The invention further contemplates a form

of strap capable of being used in the strap assembly and including a plurality of centrally disposed longitudinal slots and a plurality of apertures spaced across the width of the strap and disposed between said slots, the central portions of the slots having generally semi circular cutouts to define a central generally circular opening within the slot length.

The invention further provides a tensioning device adapted to be used with such a strap and comprising a generally bridge shaped tensioner body having an aperture in combination with a bolt and nut assembly adapted to be inserted through the opening of the slot of the strap and through the tensioner body, tightening of the bolt and nut assembly drawing the strap into the generally bridge shaped tensioner body to tension the strap.

A strap assembly embodying the invention will now be described in more detail by way of example only with reference to the accompanying drawings in which;

FIGURE 1 is a plan view of a single joint of a strap assembly.

FIGURE 2 is a side elevational view of the joint of Figure 1.

FIGURE 3 is a front elevational view of an apertured member used in making the joint.

FIGURE 4 is a side elevational view of the apertured member.

FIGURE 5 is a front elevational view of an anchor member.

FIGURE 6 is a sectional view of the strap assembly in use in securing joists to a wall.

FIGURE 7 is a front elevational view of an alternative form of apertured member.

FIGURE 8 is a side elevational view of the member of Figure 7.

FIGURE 9 is a front elevational view of an alternative form of anchor member.

FIGURE 10 is a side elevatinal view of the anchor member.

FIGURE 11 is a detail side elevational view of a strap assembly incorporating the apertured member and anchor member of Figures 7 to 10.

FIGURE 12 is an underneath plan view of the assembly of Figure 11.

FIGURE 13 illustrates an alternative form of strap for use in the assembly.

FIGURE 14 is a plan view of a tensioner body blank.

FIGURE 15 is a side elevational view of the tensioner body blank.

FIGURE 16 is a side elevational view of a tensioning assembly embodying the tensioner body and strap of Figures 13 to 15.

Referring firstly to Figure 1 of the drawings, a strap generally indicated at 10 is made up of a first part 11 and a second part 12, which are overlapped in the region 13.

Each of the strap parts 11, 12 has a pattern of openings which are continuously repeated along the length of the strap parts so that these can be cut from continuous stock.

The pattern of perforations includes pairs of fastener holes, the holes of each pair being staggered, separated by rectangular longitudinal slots 15 extending centrally along the strap. Other configurations could be used, for example that shown in Figure 13, or the strap could be supplied unperforated, particularly where the thickness of the strap is not great. However, it is required that each free end portion of the first or second part 11, 12 of the strap should have at least one longitudinal slot.

In the overlap region 13, these slots are aligned as can be seen at 16 in Figure 2. Only one pair of slots is present in the overlap region 13 as shown but it is preferable, where maximum strength is required, to provide a longer overlap region 13 with two slotsl5 of each strap part 11, 12 overlapped and aligned.

The strap parts 11, 12 are secured together by a two part clamping means. The first part of the clamping means is an apertured member 17. One embodiment is shown in Figures 3 and 4 of the drawings. This is made from strip metal, conveniently the same strip as the strap parts 11, 12. The apertured member 17 has a pair of spaced apertures 18 which are separated by a distance no greater than the thickness 19 of the overlapped region 13 of the straps. The distance between the apertures 18 can be slightly smaller than the overlap thickness 19, since this will permit the end portions of the strap parts 11 and 12 to be wedged tightly together in a manner to be described. However, if the separation of the apertures 18 is too great, this wedging action will not be possible.

The apertured member shown in Figures 3 and 4 has an enlarged head 20 for convenience of use. However, this is optional. It also has a taper 21 which provides a convenient lead-in for inserting the apertured member 17 into the aligned slots 16 of the strap at the overlap region 13.

Referring to Figure 2 of the drawings, the apertured member 17 will be seen in position in the aligned slots 16. The reason for the taper will become apparent since the width of the apertured member 17 is a tight sliding fit in the aligned slots 16. It is intended that, on site, the apertured member 17 should be inserted by tapping with a hammer. The slight taper 21 helps to move the slots 15 into exact alignment as the apertured member 17 is inserted.

Referring now to Figure 5 of the drawings, an embodiment of anchor member 22 is illustrated. This is also cropped from strip metal of a thinner gauge than the strap and apertured member.

The apertured member 22 is bifurcated and has a pair of limbs 23 which are each of generally wedge shape. Each limb 23 tapers by about 5° on both the outer edge 24 and

the inner edge 25 of the limb. The position 26 of the dotted line represents the ultimate position of the apertured member 17 when the wedge shaped limbs 23 are driven through the apertures 18. It will be seen that, to the left hand side of the dotted line 26, the limbs are radiused at 27.

The assembly is completed by inserting the limbs 23 through the apertures 18 and then deforming the limbs 23 in opposite directions as shown in Figures 1 and 2 of the drawings. This tends to draw the bifurcated anchor member 22 tightly in to the apertured member18, locking it in position and hence locking the end parts 11 and 12 of the straps together at the overlap region.

It will be appreciated that the insertion of the apertured member 17 in to the aligned slots 16 secures the strap end parts 11 and 12 against longitudinal movement under both tension and compression and, because the slots 15 are elongate, also assists in preventing lateral displacement of the parts 11 and 12 relative to each other in torsion. The anchor member 22, when driven fully home with a hammer, wedges the overlapped strap ends together because of the taper on the inner faces 25 of the limbs. The limbs themselves are wedged by the taper on the outer edges 24 of the limbs cooperating with the upper and lower borders of the apertures 18 at the radiused parts 27, when the limbs 23 are deformed using a hammer to the condition shown in Figures 1 and 2.

It has been found that adequate strength for a strap can be achieved under most circumstances using a single joint as shown in Figures 1 and 2. Greater strength in tension and compression can be used using two joints. The use of two joints also greatly increases the resistance to torsion at the overlapping region 13 of the strap ends.

Referring now to Figure 6 of the drawings this illustrates a typical example of use of the strap assembly of Figures 1 to 5. For convenience of description, the straps shown in Figure 1 and 2 are planar but, in many circumstances, it is required that one or more twists are provided in the strap and/or that the first part of the strap is bent at an angle or provided with a fishtail for use in a mortar coursing joint.

In Figure 6, a wall 28 is to be connected by the strap 10 to a plurality of floor joists 29 running parallel to the wall 28. The first part 11 of the strap is provided with a right angled downturned end 30 which is hooked over the masonry so as to extend into a cavity which is next to the wall part 28, forming part of a cavity wall (not fully illustrated). A 90° twist is shown at 31 in the drawings and this is used to bring the overlap region 13 into a vertical plane alongside a timber noggin 32 which is inserted between the floor joists 29 to rigidify the assembly. Packing 33 is provided in the usual way between the first floor joist and the adjacent wall 28.

A single joint is provided in the overlapped region 13 of the strap. The second part 12 of the strap also has a 90° twist illustrated at 34 so that the main tail of the strap part 12 again extends in a horizontal plane aligned with the first end part 11.

In use, the first part 11 can be built into the masonry wall 28 as it is being constructed and the main extent of the strap can be added later, after the joists 29 and noggins 32 have been positioned. This reduces the risk of injury to the builder and also the risk of loosening the end part 11 of the strap from its position in the wall. It will be appreciated that only a simple ning the end part 11 of the strap from its position in the wall. It will be appreciated that only a simple hammer is required to secure the joint. It may be convenient to hold the tail of the strap part 12 temporarily in position by nailing through one of the slots 15 in to the adjacent timber while the connection is made. Subsequently, the straps are firmly secured in position by fasteners such as nails inserted through the circular holes 14 at convenient locations. The staggered holes 14, provided in pairs along the strap, ensure that a suitable fixing point is available.

By using a twisted strap portion 11 or 12, most configurations of strap can be provided for, without cutting out the timber of the adjacent joists or noggins. However, this can be done if required, since the connection is a small and relative localised feature and therefore only a small amount of timber needs to be cut away.

In the example illustrated in Figures 1 to 6, the strap is of relatively thick steel, 5 mm in thickness. However, the same jointing technique can be used with a thin strap, perhaps 2.5 mm in thickness. By the use of a suitably dimensioned apertured member and anchor member, the same type of jointing can be used to secure a thick strap to a thin strap. This may be desirable for example where the structural requirement within the building is for a thin strap but a thick strap is desirable where the first end part is being inserted, somewhat as shown in Figure 6, in to the cavity of a cavity wall. Straps may also be used wholly within the building under circumstances where different thicknesses are required in different areas. For example, it may be desirable to use a thick strap for bracing a stairwell structure, connected to thinner straps adjacent its ends.

Figures 7 to 12 show a modified strap assembly and its component parts. An apertured member 40 is provided with a single aperture 41 spaced by a distance *d* less than the thickness of two overlapped strap ends, from a head 42 of the apertured member. The apertured member is tapered at 43 so that it can

be inserted through the aligned slots as before. However, the apertured member is driven fully home until the aperture 41 is on one side of the overlapped strap ends and the head 42 is located firmly against the other side.

A tapered wedge-shaped anchor member 44 illustrated in Figures 9 and 10 and made of thinner gauge sheet metal is then inserted through the aperture 41. The taper on the anchor member 44 is typically of the order of 6°. Again, a radiused underside 45 is provided to improve the wedging action as the anchor member 44 is driven home in the aperture 41 by means of a hammer and then deformed laterally.

The latter stage can be seen in Figures 11 and 12 of the drawings where a pair of overlapped strap portions 46 are secured together by an apertured member 40 and an anchor member 44, the tip 47 of which has been deformed laterally.

It will be seen that the head 42 of the apertured member 40 has a pair of tapered formations 48 which project at approximately 30° to the surface of the strap 46 in use. The function of these tapers on the shallow head 42 is to permit the head to be driven into adjacent timber if necessary when the strap is in use.

Figure 13 of the drawings illustrates an alternative form of strap in which slots 50 have enlarged central generally circular openings 51 formed by pairs of semi circular cut-outs 52 in the side edges of the slot 50. The strap also has circular apertures to receive fasteners, indicated at 53 in the drawings. These apertures are spread across and along the strap between the positions of the slots.

This pattern is particularly advantageous for use with thin straps as referred to above. It may be difficult to ensure correct tensioning of a thin strap in particular when it is assembled using the connection means described. However, the strap of Figure 13 can be tensioned using a tensioning member including a body 54 as shown in Figure 16 and a bolt and nut assembly generally indicated at 55.

The body 54 is formed from a sheet metal blank illustrated in Figures 14 and 15, of thick sheet metal and having an elongate opening 56 disposed centrally. The opening 56 can also be seen in Figure 16, receiving the bolt and nut assembly 55.

The tensioner body 54 is bridge shaped in section and is made of thick rigid metal. The relatively thin strap 57 can therefore be drawn into the hollow of the bridge shaped tensioning body 54 by tightening the bolt and nut assembly 55. The latter passes through the generally circular opening 51 of the slot 50 in the slot and also through the elongate opening 56 of the tensioner body.

In use, the strap portions can be secured together as previously described and the whole assembly then tensioned by use of the tensioning device.

CLAIMS

1. A strap assembly for building, the assembly comprising a first strap part and a second strap part, each part having at least one longitudinal slot in an end portion to be connected to the other part; the assembly further comprising clamping means including an apertured member of a size adapted to be inserted as a sliding fit in the aligned slots when said end portions are over lapped, the apertured member having an aperture and a location means spaced from the aperture by no more than the thickness of the overlapped end portions; and anchor means adapted to be inserted through the aperture and permanently secured therein to prevent disengagement of the apertured member from the slots.

2. A strap assembly according to Claim 1 wherein the location means comprise a second aperture.

3. A strap assembly according to Claim 1 wherein the location means comprise a projection such as a head of the apertured member.

4. A strap assembly according to Claim 3 wherein the head has shallow dimensions relative to the thickness of the strap.

5. A strap assembly according to Claim 3 or Claim 4 wherein the head includes taper means directed away from said aperture to permit the head to be driven into timber.

6. A strap assembly according to any preceding Claim wherein the anchor means are adapted to be deformed after insertion to secure the anchor means permanently in position.

7. A strap assembly according to any preceding Claim wherein the anchor means include at least one wedge, adapted to force the first and second strap parts together when the anchor means is inserted into the aperture member.

8. A strap assembly according to any preceding Claim wherein the anchor means are bifurcated to provide a pair of limbs adapted to be inserted respectively in two apertures of the apertured member.

9. A strap assembly according to Claim 7 wherein the limbs are each of a wedge shape.

10. A strap assembly according to Claim 8 or Claim 9 wherein, after insertion, the free ends of the limbs are adapted to be deformed in opposite directions out of the general plane of the anchor means to secure the anchor means permanently in position.

11. A strap assembly according to any preceding Claim wherein the anchor means and apertured member are of sheet or strip metal such as galvanised mild steel or stainless steel.

12. A strap assembly according to any preceding Claim wherein one or both of the strap parts are formed with a twist.

13. A method of building including the

steps of taking a first strap part and a second strap part, each part having at least one longitudinal slot in an end portion;

securing the first strap part to a building structure;

overlapping said end portions to align the said slots;

taking an apertured member having an aperture and a location means spaced from the aperture by no more than the thickness of the overlapped end portions;

inserting the apertured member through said aligned slots;

and inserting an anchor means through said aperture of the apertured member and permanently securing the anchor means therein.

14. A method according to Claim 13 wherein the anchor means are secured by deforming it after insertion in the apertured member.

15. A strap capable of being used in the strap assembly according to any one of Claims 1 to 12 and including a plurality of centrally disposed longitudinal slots and a plurality of apertures spaced across the width of the strap and disposed between said slots, the central portions of the slots having generally semi circular cut outs to define a central generally circular opening within the slot length.

16. A tensioning device adapted to be used with a strap according to Claim 15 and comprising a generally bridge shaped tensioner body having an aperture, in combination with a bolt and nut assembly adapted to be inserted through the opening of the slot of the strap and through the tensioner body, tightening of the bolt and nut assembly drawing the strap into the generally bridged shaped tensioner body to tension the strap.

17. A strap assembly substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 12 of the accompanying drawings.

18. A strap assembly substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 12 as modified by Figure 13 of the accompanying drawings.

19. A method of building using a strap according to Claim 13 and substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

20. A strap for use in a strap assembly, the strap being substantially as hereinbefore described with reference to and as illustrated in Figures 1 to 12 of the accompanying drawings.

21. A strap for use in a strap assembly, the strap being substantially as hereinbefore described with reference to and as illustrated in Figure 13 of the accompanying drawings.

22. A tensioning device substantially as hereinbefore described with reference to and as illustrated in Figures 13 to 16 of the accompanying drawings.

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